## Ardaite $Pb_{19}Sb_{13}S_{35}Cl_7$

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**Crystal Data:** Monoclinic. *Point Group:* n.d. As aggregates of acicular crystals, to 2 $\mu$m, as isolated inclusions in sulfides and sulfosalts.

**Physical Properties:** Hardness = n.d. VHN = n.d. D(meas.) = n.d. D(calc.) = [6.44]

**Optical Properties:** Opaque. *Color:* Grayish green or bluish green. *Luster:* Metallic. *Pleochroism:* Distinct. *Anisotropism:* Distinct.

$R_1$–$R_2$: (400) —, (420) —, (440) 31.3–33.2, (460) —, (480) 32.1–34.4, (500) —, (520) 32.3–35.1, (540) —, (560) —, (580) 31.7–34.7, (600) —, (620) 31.1–33.9, (640) —, (660) 30.6–32.8, (680) —, (700) 30.3–31.8

**Cell Data:** *Space Group:* n.d. $a = 21.09$ $b = 22.11$ $c = 8.05$ $\beta = 103.02°$ Z = 2

**X-ray Powder Pattern:** Synthetic.
3.43 (100), 2.83 (80), 3.13 (40), 1.90 (30), 4.24 (20), 3.90 (20), 2.36 (20)

**Chemistry:**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Pb | 56.50 | 57.94 | 57.14 | 59.37 |
| Ag | 0.04 | 0.00 | | |
| Fe | 0.00 | 0.31 | | |
| Sb | 22.48 | 21.44 | 22.97 | 20.94 |
| S | 15.56 | 15.44 | 16.29 | 15.62 |
| Cl | 3.78 | 4.39 | 3.60 | 4.06 |
| Total | 98.36 | 99.52 | 100.00 | 100.00 |

(1) Madjarovo, Bulgaria; by electron microprobe, average of six analyses. (2) Gruvåsen, Sweden; by electron microprobe, average of 17 analyses. (3) $Pb_{19}Sb_{13}S_{35}Cl_7$. (4) $Pb_{10}Sb_6S_{17}Cl_4$.

**Occurrence:** Very rare in polymetallic ore deposits.

**Association:** Galena, nadorite, chlorian robinsonite, chlorian semseyite, pyrostilpnite, argentian tetrahedrite, anglesite (Madjarovo, Bulgaria); sphalerite, pyrrhotite, chalcopyrite, magnetite, scheelite, stannite, pyrargyrite, silver, antimony, arsenopyrite, nisbite, graphite (Gruvåsen, Sweden).

**Distribution:** From Madjarovo, eastern Rhodope Mountains, Bulgaria [TL]. In the Dressfall mine, Gruvåsen, Bergslagen metallic province, Sweden.

**Name:** For the Arda River, Bulgaria, which runs through the Madjarovo deposit.

**Type Material:** n.d.

**References:** (1) Breskovska, V.V., N.N. Mozgova, N.S. Bortnikov, A.I. Gorshkov, and A.I. Tsepin (1982) Ardaite — a new lead–antimony chlorosulphosalt. Mineral. Mag., 46, 357–61. (2) (1983) Amer. Mineral., 68, 642 (abs. ref. 1). (3) Burke, E.A.J., C. Kieft, and M.A. Zakrzewski (1981) The second occurrence of ardaite: Gruvåsen, Bergslagen, Sweden. Can. Mineral., 19, 419–422.

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